DATE: February 14, 2006

TO: Biomedical Research and Development Price Index Distribution List

FROM: Economist, Office of Portfolio Analysis and Strategic Initiatives, Office of the
               Director, NIH

SUBJECT: **REVISION OF** Biomedical Research and Development Price Index: **Revised** FY
               2005 Update and Projections for FY 2006-2016

This note replaces the original announcement of the Biomedical Research and Development Price
Index (BRDPI) update dated January 24, 2006 and posted on the NIH Website on February 6, 2006.
**It announces a revision of the estimated value of the BRDPI for FY2005 from 4.0 percent to 5.5
percent.**

The projected future year values have also been revised. The NIH now projects the BRDPI to
increase by 4.1percent for FY 2006; 3.8 percent for FY 2007 and FY2008; 3.7 percent for each year
from 2009 through 2011; and 3.8 percent for each year from 2012 through 2016. This represents an
upward adjustment of 0.3 to 0.4 percentage points in estimated annual growth for each year
compared to the projections released earlier.

As spelled out below, each December or early January, the Bureau of Economic Analysis (BEA),
Department of Commerce provides an estimate of the BRDPI for the fiscal year completed on the
previous September 30. The estimate is regarded as preliminary and may be revised the following
year. The estimate is based on the best available data at that time. But the underlying prices used are
often revised or updated in the following months as more comprehensive data are reported and as
specialized surveys are completed.

This revision of the BRDPI is due primarily to the updating of data from the Association of
American Medical Colleges (AAMC), survey of salaries and benefits for medical school faculty (See
"Report On Medical School Faculty Salaries 2004-2005,"January 2006). The AAMC survey along
with the AAU survey of compensation of university faculty is the basis of the estimate of salary and
benefit rates for staff on extramural awards. The results of the 2005 survey were not available to
BEA in December 2005. Therefore, BEA extrapolated a 2005 value from past trends in the AAMC
survey data. Subsequently, on February 6, 2006, AAMC was able to provide the results of the survey
to BEA, which led to the current correction.

Ordinarily, the revision of the FY 2005 value would not be reported to NIH until December 2006.
Because of the well above-average increase in medical school wages and benefits and its large effect
on the BRDPI, BEA chose to report the revision immediately to NIH. NIH, in turn, modified the
projection for future years accordingly and chose to release the revision now rather than wait until
the next scheduled update of the BRDPI in January 2007.

We believe that, given the large revision of the estimated BRDPI increase for FY 2006, it is
important to provide the most recent estimate based on more complete information on input prices.

Summary

- The Bureau of Economic Analysis (BEA) in the U.S. Department of Commerce estimated a 5.5 percent increase in the Biomedical Research and Development Price Index (BRDPI) for FY 2005, and it revised the FY 2004 estimate, up slightly from 3.5 percent to 3.6 percent.

- The BEA estimated increase of 5.5 percent for FY 2005 is greater than the 3.3 percent increase NIH projected for FY 2005 last January 2005. This difference is attributable to two primary causes. First, the general rate of inflation, as measured by the price index for the Gross Domestic Product, increased by 2.8 percent rather than by the 2.0 percent increase projected by OMB in December 2004. Second, the increase in academics salaries and fringe benefits was much greater than in any of the previous ten years.

- The NIH projects the BRDPI to increase by 4.1 percent for FY 2006; 3.8 percent for FY 2007 and FY2008; 3.7 percent for each year from 2009 through 2011; and 3.8 percent for each year from 2012 through 2016.

- Annual values of the BRDPI can be found on the NIH website at http://officeofbudget.od.nih.gov/UI/GDP_FromGenBudget.htm or go to http://www.nih.gov/ and use the NIH search engine to find "BRDPI."

- The projections for future year values are prepared in the Office of Portfolio Analysis and Strategic Initiatives (OPASI), OD, NIH. Further inquiries should be directed to js41z@nih.gov).

- Each January, NIH updates the BRDPI table based on the most recent data provided by the BEA.

Definition of the BRDPI

The BRDPI measures changes in the weighted-average of the prices of all the inputs (e.g., personnel services, various supplies, and equipment) purchased with the NIH budget to support research. The annual change in the BRDPI indicates how much the NIH budget would need to change to maintain purchasing power—to compensate for the average increase in prices and to maintain NIH-funded research activity at the previous year's level.

The BEA developed the BRDPI in the early 1980s and provides annual updates under an interagency agreement with the NIH. This year, the BEA updated the BRDPI through FY 2005. The weights used to construct the index reflect the actual pattern (or the proportion) of total NIH expenditures spent on each of the types of inputs purchased (e.g., personnel services, various supplies, and equipment).

In response to BEA recommendations, the expenditure weights used to estimate the BRDPI have been updated periodically. Also, in the BRDPI table of Annual Values listed on the NIH website and in the attached Table A, the values of the BRDPI for FY 1999-2005 are constructed using the FY 2003 expenditure weights; the FY 1991-1998 values are based on FY 1993 weights; the FY 1986-1990 values are based on FY 1988 weights; and the FY 1979-1985 values are based on FY 1984 weights. The pre-1979 values of the BRDPI were estimated using a preliminary methodology with a

less-detailed set of expenditure weights. As a result of the less precise methodology, the pre-1979 values are not likely to be as accurate as the later year values.

The occasional updating, or rebasing, of expenditure weights is intended to overcome the well-known problem of substitution bias. Substitution bias in a price index results when comparisons of prices over several years are made using a fixed set of weights based on the composition of expenditures in a single, specified base year. The fixed-weight comparison implicitly assumes the composition of expenditures does not change over time. In periods close to the base year, differences in the composition are usually fairly small, and a fixed-weight index provides a good approximation of price change. Farther away from the base period, however, larger differences in composition are likely. This substitution bias generally causes an overstatement of price increases for periods after the base year and an understatement of price increases for periods before the base year. Weighting formulas that allow for changes in composition over time provide a better measure of both year-to-year price changes and long-term trends.

The 2005 Update and Projections for FY 2006-2016

Each December, the BEA provides an estimate of the BRDPI for the most recently completed Fiscal Year (in December 2005 it was for FY 2005). This estimate is referred to as "preliminary" because the initial data on prices available to the BEA are often revised later in the year. Consequently, each year the BEA also provides a revised estimate for the Fiscal Year before last (e.g., the estimate for FY 2004 is revised in December 2005). This year, the BEA estimated a 5.5 percent increase in the Biomedical Research and Development Price Index (BRDPI) for FY 2005, and it revised the FY 2004 estimate, up slightly from 3.5 percent to 3.6 percent.

The realized increase in the BRDPI of 5.5 percent exceeded the projection made last January 2005 of 3.3 percent growth in the BRDPI for FY 2005. This difference is attributable to two primary causes. First, the general rate of inflation, as measured by the price index for the Gross Domestic Product, increased by 2.8 percent rather than by the 2.0 percent increase projected by OMB in December 2004 as part of its annual budget assumptions. Second, the increase in academics salaries and fringe benefits was much greater than in any of the previous ten years.

Projections of future annual changes in the BRDPI reflect two considerations. The first is the expected general rate of inflation of prices for the U.S. economy. The second is the expected relationship between the general rate of inflation and changes in the BRDPI.

NIH defers judgments on the general rate of inflation to the U.S. Office of Management and Budget (OMB). We use the OMB projections of the annual rate of growth of the Price Index for the Gross Domestic Product (GDP). In the aftermath of the unexpected 2.8 percent increase in the GDP Price Index during FY 2005, in December 2005 OMB increased its out-year forecasts somewhat compared to the forecasts it distributed the previous year. However, OMB clearly does not expect the FY 2005 rate of inflation to persist. They project an increase of 2.5 percent for FY 2006; a 2.2 percent increase during FY 2007 and FY 2008; then 2.1 during FY 2009 through FY 2011; and back up to 2.2 percent for each of the years FY 2012 through FY 2016.

The historical relationship between the BRDPI and the GDP Price Index is summarized by a statistically estimated linear equation that relates the annual percent change in the BRDPI to the annual percent change in the GDP Price Index. Using the most recently available data for annual changes for the years FY 1996 through FY 2005, the estimated equation is:

(Projected annual percent change in the BRDPI)
$$= 1.32 + 01.12 \text{ x (annual percent change in GDP Price Index)}.$$

Forecasting the future path of price changes is an inherently imprecise exercise. We cannot expect OMB projections to be correct each year. Likewise, because the complex relationship between the general rate of inflation and the BRDPI increase is approximated with a simple linear equation, year-to-year errors are inevitable. However, we strive for an unbiased process – i.e., the projections miss high as frequently as they miss low.

The 5.5 percent increase in the BRDPI was well above the historical pattern predicted by the estimated equation. However, we doubt that the above average increase in academic salaries can persist over the next few years. As expressed above, we accede to the OMB forecast of the general rate of inflation. While it was higher than expected this year, the OMB projects the rate of inflation will tend to diminish somewhat over the next few years.

Since we have no reason to believe the above average growth of the BRDPI will persist, we plug the OMB forecasted value for the change in the GDP Price Index into the equation above to derive the projected value of the increase in the BRDPI for each future year.

Thus, NIH projects the BRDPI to increase by 4.1 percent for FY 2006; 3.8 percent for FY 2007 and FY2008; 3.7 percent for each year from 2009 through 2011; and 3.8 percent for each year from 2012 through 2016. Given the large increase in the BRDPI during FY 2006, projections for FY 2006-FY 2016 are relatively conservative.

Revisions in Estimates for FY 1994 through FY 2004

For completeness, we report on a couple of technical corrections to the BRDPI values published last year for FY 1994- FY2004.

When constructing the BRDPI with expenditure weights for a given base year, it is important to express each year's prices relative to that same base year. Last January 2005 we inadvertently published BRDPI values for FY 1994 through FY 1998 that had been constructed using expenditure weights for 1993, but with prices for each of the 43 major expenditure categories expressed relative to the 2003 price for the expenditure category. The values for those years were revised by expressing each year's prices relative to 1993 prices. The correction yielded larger estimates of the annual growth in the BRDPI for each year than those published in January 2005. Also, we note the values for FY 1994 through FY 1998 published this year, while different than those published in January 2005, are identical to the values published in January 2004 and in earlier years.

The values of the BRDPI for FY 1999 to FY 2004 were also revised slightly upward, but for a different reason. As a first step in implementing chain-weighted indexes, the BEA has implemented an annual survey of extramural institutions. The survey data provides information on the distribution of direct expenditures on awards across categories of inputs. BEA used the current survey data to refine the extramural expenditure weights estimated last year with a smaller survey sample.

Summary Tables

Table A includes values of the annual percent change in the GDP Price Index and the BRDPI for FY

1980-2005. Table B includes NIH's projected values of the BRDPI and the GDP Price Index for FY 2006-FY 2016.

For the convenience of the reader, Table C illustrates how to translate <u>annual changes</u> into <u>annual levels</u> of the BRDPI. After designating a reference year, for which the value of the BRDPI is specified as 100, projections of the<u> annual levels</u> of the BRDPI can be constructed using the following recursive relationship:

BRDPI (for year t) = BRDPI (for year t-1) x [1 + {Annual Percent Change (for year t)}]

In Table C, the calculations are presented for the years 1989-1992 using the reference year 1989 = 100. To calculate the value for FY 1991, for example, the formula would be:
110.5 = 105.4 x 1.048.
In other words, to derive the BRDPI value for FY 1991 (110.5), start with the FY 1990 BRDPI value (105.4) and multiply by one plus the annual change for FY 1991 (1+ [4.8/100] =1.048).

James A. Schuttinga, Ph.D.

Attachments

TABLE A

HISTORICAL ANNUAL PERCENT CHANGES

Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
1980	8.8%	9.8%
1981	9.8%	10.4%
1982	6.8%	8.6%
1983	4.4%	6.2%
1984	3.7%	5.9%
1985	3.2%	5.6%
1986	2.3%	4.2%
1987	2.6%	5.3%
1988	3.1%	5.0%
1989	3.9%	5.2%
1990	3.7%	5.4%
1991	3.7%	4.8%
1992	2.5%	4.4%
1993	2.3%	3.4%
1994	2.2%	3.9%
1995	2.1%	3.5%
1996	1.9%	2.6%
1997	1.7%	2.8%
1998	1.2%	3.4%
1999	1.3%	3.0%
2000	2.0%	3.7%
2001	2.4%	3.6%
2002	1.9%	3.2%
2003	2.0%	4.0%
2004	2.4%	3.6%
2005	2.8%	5.5%

TABLE B

PROJECTED ANNUAL PERCENT CHANGES

Fiscal Year	GDP Price Index	BRDPI
Col.(1)	Col.(2)	Col.(3)
2006	2.5%	4.1%
2007	2.2%	3.8%
2008	2.2%	3.8%
2009	2.1%	3.7%
2010	2.1%	3.7%
2011	2.1%	3.7%
2012	2.2%	3.8%
2013	2.2%	3.8%
2014	2.2%	3.8%
2015	2.2%	3.8%
2016	2.2%	3.8%

TABLE C

Conversion of Annual Changes into Annual Levels

Fiscal Year	Annual Percent Change	[1+(Percent Change/100)]	Previous Year Value	Annual Level BRDPI
Col.(1)	Col.(2)	Col.(2)	Col.(4)	Col.(3)
1989				100.0
1990	5.4%	1.054	* 100.0 =	105.4
1991	4.8%	1.048	* 105.4 =	110.5
1992	4.4%	1.044	* 110.5 =	115.4